

HINGE MECHANISM WITH CLUTCHING  
FUNCTION

## BACKGROUND OF THE INVENTION

The present invention relates generally to hinge mechanisms. More particularly, the present invention relates to a hinge mechanism which is suitable for use in a portable computing device such as a notebook computer.

Advances in computing hardware technology continue to enable lower dimensional profile computing devices while maintaining robust processing power typically associated with larger devices. No where are these advances more apparent than in the portable computing field. Notebook computers, once a burdensome luxury with limited capability, are now full-featured computing devices that are quickly becoming ubiquitous in both the business and home markets.

Portable computing devices may be typically configured with a base housing various computer components and a display. In one such example, FIG. 1 is an illustrative representation of a portable computing device 100. Portable computing device 100 includes a base 106 and a display 104. Base 106 may house a variety of computer components including a keyboard 110, a pointing device 112, a removable disk drive 114, and a permanent disk drive 116. Base 106 may further include a variety of access ports for interfacing with other computing components including, but not limited to, a USB port (not shown), a parallel port (not shown), a serial port (not shown), a docking station interconnect (not shown), a network port (not shown) or a monitor port (not shown). Further, display 104 may be configured in any of a number of different sizes and resolutions depending on user preference.

Base 106 and display 104 may be attached with a hinge mechanism 108. In the example illustrated, display 104 rotates about an axis defined by hinge 108 from closed (0°) to approximately 120°. In a typical configuration, a single pin is integral to hinge 108 and provides a rotational axis about which display 104 may rotate. In some examples, hinge 108 may be configured with a braking device (not shown). Braking devices generally apply sufficient holding force to allow freedom of movement of a display without lifting a base and to allow a display to maintain a desired position.

As can be appreciated, a pinned hinge mechanism configuration requires the mechanism to be located at or nearly proximal to a base edge because of clearance requirements. That is, in order for a display to rotate freely about a pinned hinge mechanism, the display must be located such that any display portion extending beyond the pinned hinge mechanism does not interfere with the base. Furthermore, because the location of a pinned hinge mechanism must be located at or nearly proximal to a base edge, there must be sufficient structural strength to support the configuration at the base edge.

In current examples, where portable computing device bases range from approximately 20 to 30 mm in thickness, there exists ample structural strength to support a hinge located at or nearly proximal to a base edge. However, as noted above, portable computing device profiles are continually shrinking along with integral computer components. As such, base thicknesses under approximately 20 mm are becoming increasingly common. In at least some of those examples, a pinned hinge mechanism's structural requirements may exceed the structural capability of base materials given smaller size design requirements thus necessitating relocation of a hinge mechanism away from a base edge. Therefore improved hinge mechanisms are described herein.

## SUMMARY OF INVENTION

In embodiments of the present invention, hinge mechanisms for use in a portable computing device having a base and a lid are presented, the hinge mechanism including: a base link pivotally connected with a base such that the base link rotates about a first axis of rotation, the base link being in sliding communication with a lid; a lid link pivotally connected with the lid such that the lid link rotates about a second axis of rotation, the lid link being in sliding communication with the base; and a center pin pivotally connecting the base link with the lid link such that the base link and the lid link rotate about a third axis of rotation wherein the base link, the lid link, and the center pin cooperatively function to translate the lid over at least two planes of motion with respect to the base. In some embodiments, the hinge mechanism further includes: a base slider pin rigidly attached with the base link, the lid configured to slidably receive the base slider pin; and a lid slider pin rigidly attached with the lid link, the base configured to slidably receive the lid slider pin.

In other embodiments, portable computing devices are presented including: a base; a lid; and a hinge mechanism coupled with the base and the lid and arranged to translate the lid vertically and horizontally with respect to the base while the lid pivotally rotates with respect to the base. In some embodiments, the hinge mechanism further includes: a base link pivotally connected with the base such that the base link rotates about a first axis of rotation, the base link being in sliding communication with the lid; a lid link pivotally connected with the lid such that the lid link rotates about a second axis of rotation, the lid link being in sliding communication with the base; a center pin pivotally connecting the base link with the lid link such that the base link and the lid link rotate about a third axis of rotation wherein the base link, the lid link, and the center pin cooperatively function to translate the lid over at least two planes of motion with respect to the base; a base slider pin rigidly attached with the base link, the lid configured to slidably receive the base slider pin; and a lid slider pin rigidly attached with the lid link, the base configured to slidably receive the lid slider pin.

In other embodiments, hinge mechanisms for coupling a first piece to a second piece are presented including: a first link pivotally connected with the first piece such that the first link rotates about a first axis of rotation, the first link being in sliding communication with the second piece; a second link pivotally connected with the second piece such that the second link rotates about a second axis of rotation, the second link being in sliding communication with the first piece; a center pin pivotally connecting the first link with the second link such that the first link and the second link rotate about a third axis of rotation wherein the first link, the second link, and the center pin cooperatively function to translate the second piece over at least two planes of motion with respect to the first piece; a first piece slider pin rigidly attached with the first link, the second piece configured to slidably receive the first piece slider pin; and a second piece slider pin rigidly attached with the second link, the first piece configured to slidably receive the second piece slider pin.

## BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings and in which like reference numerals refer to similar elements and in which:

FIG. 1 is an illustrative representation of a portable computing device;